

**IN THE CLAIMS:**

Kindly amend the claims, as follows:

1. (Original) A method to perform low-density parity-check code encoding of user data  $u$  of length  $N_u$ , by inserting parity data  $p$  of length  $N_p$  into output data  $c$  of length  $N$  in accordance with a parity matrix  $H$  such that  $H \cdot c = 0$ , comprising the steps of:

- (a) receiving the user data of block length  $N_u$ ;
- (b) decomposing  $H \cdot c$  into a first component  $H_u \cdot u$  corresponding to the user data and a second component  $H_p \cdot p$  corresponding to the parity data such that  $H_u \cdot u + H_p \cdot p = 0$ ;
- (c) calculating a vector  $\underline{u} = H_u \cdot u$ ; and
- (d) calculating  $p = H_u^{-1} \cdot \underline{u}$ .

2. (Original) The method of Claim 1, wherein  $H_u$  comprises a  $N_p \times N_u$  matrix and  $H_p$  comprises a  $N_p \times N_p$  matrix.

3. (Original) The method of Claim 1, further comprising the step of:

- (e) receiving address information,  
wherein step (c) is performed in accordance with step (e).

4. (Original) The method of Claim 1, wherein step (c) comprises the step of:

- (f) updating elements of  $\underline{u}$  as follows:  
 $u(i) = u(i) \oplus \text{bit}$ .

5. (Original) The method of Claim 1, wherein step (d) comprises the step of:

- (g) reducing a row weight of  $H_u^{-1}$  by representing  $H_u^{-1}$  as  $M1 * M2$ .

6. (Original) The method of Claim 1, wherein step (d) comprises the step of:

- (g) reducing a row weight of  $H_u^{-1}$  by representing  $H_u^{-1}$  as  $\prod_{i=1}^5 M_i$ .

7. (Original) The method of Claim 1, wherein step (c) is performed prior to step (d).

8. (Original) A low-density parity-check code encoder to encode user data  $u$  of length  $N_u$ , by inserting parity data  $p$  of length  $N_p$  into output data  $c$  of length  $N$  in accordance with a parity matrix  $H$  such that  $H \cdot c = 0$ , comprising:

an input to input the user data of block length  $N_u$ ;

an  $H$   $c$  decomposer to decompose  $H \cdot c$  into a first component  $H_u \cdot u$  corresponding to the user data and a second component  $H_p \cdot p$  corresponding to the parity data such that  $H_u \cdot u + H_p \cdot p = 0$ ;

a  $\underline{u}$  calculator to calculate a vector  $\underline{u} = H_u \cdot u$ ; and

a  $p = \underline{P} \underline{u}$  calculator to calculate  $p = H_u^{-1} \cdot \underline{u}$ .

9. (Original) The encoder of Claim 8, wherein  $H_u$  comprises a  $N_p \times N_u$  matrix and  $H_p$  comprises a  $N_p \times N_p$  matrix.

10. (Original) The encoder of Claim 8, further comprising:

a second input to input address information,

wherein said  $\underline{u}$  calculator calculates the vector  $\underline{u} = H_u \cdot u$  in accordance with said second input.

11. (Original) The encoder of Claim 8, wherein said  $\underline{u}$  calculator updates elements of  $\underline{u}$  as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

12. (Original) The encoder of Claim 8, wherein said  $p = \underline{P} \underline{u}$  calculator reduces a row weight of  $H_u^{-1}$  by representing  $H_u^{-1}$  as  $M1 * M2$ .

13. (Original) The encoder of Claim 8, wherein said  $p=P$   $u$  calculator reduces a row weight of  $H_u^{-1}$  representing  $H_u^{-1}$  as  $\prod_{i=1}^s M_i$ .

14. (Original) The encoder of Claim 8, wherein said  $u$  calculator calculates the vector  $u = H_u \cdot u$  prior to said  $p=P$   $u$  calculator calculating  $p = H_u^{-1} \cdot u$ .

15. (Original) A computer program to perform low-density parity-check code encoding of user data  $u$  of length  $N_u$ , by inserting parity data  $p$  of length  $N_p$  into output data  $c$  of length  $N$  in accordance with a parity matrix  $H$  such that  $H \cdot c = 0$ , comprising the steps of:

- (a) receiving the user data of block length  $N_u$ ;
- (b) decomposing  $H \cdot c$  into a first component  $H_u \cdot u$  corresponding to the user data and a second component  $H_p \cdot p$  corresponding to the parity data such that  $H_u \cdot u + H_p \cdot p = 0$ ;
- (c) calculating a vector  $u = H_u \cdot u$ ; and
- (d) calculating  $p = H_u^{-1} \cdot u$ .

16. (Original) The computer program of Claim 15, wherein  $H_u$  comprises a  $N_p \times N_u$  matrix and  $H_p$  comprises a  $N_p \times N_p$  matrix.

17. (Original) The computer program of Claim 15, further comprising the step of:

- (e) receiving address information,  
wherein step (c) is performed in accordance with step (e).

18. (Original) The computer program of Claim 15, wherein step (c) comprises the step of:

- (g) updating elements of  $u$  as follows:  
 $u(i) = u(i) \oplus \text{bit}$ .

19. (Original) The computer program of Claim 15, wherein step (d) comprises the step of:

(g) reducing a row weight of  $\mathbf{H}_u^{-1}$  by representing  $\mathbf{H}_u^{-1}$  as  $\mathbf{M1} * \mathbf{M2}$ .

20. (Original) The computer program of Claim 15, wherein step (d) comprises the step of:

(g) reducing a row weight of  $\mathbf{H}_u^{-1}$  by representing  $\mathbf{H}_u^{-1}$  as  $\prod_{i=1}^s \mathbf{M}_i$ .

21. (Original) The computer program of Claim 15, wherein step (c) is performed prior to step (d).

22. (Original) A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

a low-density parity-check code encoder to encode user data  $\mathbf{u}$  of length  $N_u$ , by inserting parity data  $\mathbf{p}$  of length  $N_p$  into output data  $\mathbf{c}$  of length  $N$  in accordance with a parity matrix  $\mathbf{H}$  such that  $\mathbf{H} \cdot \mathbf{c} = 0$ , comprising:

an input to input the user data of block length  $N_u$ ;

an  $\mathbf{H} \mathbf{c}$  decomposer to decompose  $\mathbf{H} \cdot \mathbf{c}$  into a first component  $\mathbf{H}_u \cdot \mathbf{u}$  corresponding to the user data and a second component  $\mathbf{H}_p \cdot \mathbf{p}$  corresponding to the parity data such that  $\mathbf{H}_u \cdot \mathbf{u} + \mathbf{H}_p \cdot \mathbf{p} = 0$ ;

a  $\underline{\mathbf{u}}$  calculator to calculate a vector  $\underline{\mathbf{u}} = \mathbf{H}_u \cdot \mathbf{u}$ ; and

a  $\mathbf{p} = \underline{\mathbf{P}} \underline{\mathbf{u}}$  calculator to calculate  $\mathbf{p} = \mathbf{H}_u^{-1} \cdot \underline{\mathbf{u}}$ ;

a transmitter to transmit an output of said low-density parity-check code encoder to the communication channel;

a soft channel decoder to decode data from the communication channel; and

a soft low-density parity-check code decoder to decode data decoded by said soft channel decoder.

23. (Original) The system of Claim 22, wherein  $\mathbf{H}_u$  comprises a  $N_p \times N_u$  matrix and  $\mathbf{H}_p$  comprises a  $N_p \times N_p$  matrix.

24. (Original) The system of Claim 22, further comprising:  
an address generator to generate address information in accordance with the user data;  
second input means for inputting address information,  
a second input to input address information,  
wherein said  $\underline{u}$  calculator calculates the vector  $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$  in accordance with said second input.

25. (Original) The system of Claim 22, wherein said  $\underline{u}$  calculator updates elements of  $\underline{u}$  as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

26. (Original) The system of Claim 22, wherein said  $p = \underline{P} \underline{u}$  calculator reduces a row weight of  $\mathbf{H}_u^{-1}$  by representing  $\mathbf{H}_u^{-1}$  as  $M1 * M2$ .

27. (Original) The system of Claim 22, wherein said  $p = \underline{P} \underline{u}$  calculator reduces a row weight of  $\mathbf{H}_u^{-1}$  representing  $\mathbf{H}_u^{-1}$  as  $\prod_{i=1}^s M_i$ .

28. (Original) The system of Claim 22, wherein said  $\underline{u}$  calculator calculates the vector  $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$  prior to said  $p = \underline{P} \underline{u}$  calculator calculating  $p = \mathbf{H}_u^{-1} \cdot \underline{u}$ .

29. (Original) A low-density parity-check code encoder to encode user data  $\mathbf{u}$  of length  $N_u$ , by inserting parity data  $p$  of length  $N_p$  into output data  $c$  of length  $N$  in accordance with a parity matrix  $\mathbf{H}$  such that  $\mathbf{H} \cdot \mathbf{c} = 0$ , comprising:  
input means for inputting the user data of block length  $N_u$ ;

$H$  c decomposer means for decomposing  $H \cdot c$  into a first component  $H_u \cdot u$  corresponding to the user data and a second component  $H_p \cdot p$  corresponding to the parity data such that  $H_u \cdot u + H_p \cdot p = 0$ ;

$\underline{u}$  calculating means for calculating a vector  $\underline{u} = H_u \cdot u$ ; and

$p = \underline{P} \underline{u}$  calculating means for calculating  $p = H_u^{-1} \cdot \underline{u}$ .

30. (Original) The encoder of Claim 29, wherein  $H_u$  comprises a  $N_p \times N_u$  matrix and  $H_p$  comprises a  $N_p \times N_p$  matrix.

31. (Original) The encoder of Claim 29, further comprising:

second input means for inputting address information,

wherein said  $\underline{u}$  calculating means calculates the vector  $\underline{u} = H_u \cdot u$  in accordance with said second input means.

32. (Original) The encoder of Claim 29, wherein said  $\underline{u}$  calculating means updates elements of  $\underline{u}$  as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

33. (Original) The encoder of Claim 29, wherein said  $p = \underline{P} \underline{u}$  calculating means reduces a row weight of  $H_u^{-1}$  by representing  $H_u^{-1}$  as  $M1 * M2$ .

34. (Original) The encoder of Claim 29, wherein said  $p = \underline{P} \underline{u}$  calculating means reduces a row weight of  $H_u^{-1}$  representing  $H_u^{-1}$  as  $\prod_{i=1}^s M_i$ .

35. (Original) The encoder of Claim 29, wherein said  $\underline{u}$  calculating means calculates the vector  $\underline{u} = H_u \cdot u$  prior to said  $p = \underline{P} \underline{u}$  calculating means calculating  $p = H_u^{-1} \cdot \underline{u}$ .

36. (Original) A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

low-density parity-check code encoding means to encode user data  $u$  of length  $N_u$ , by inserting parity data  $p$  of length  $N_p$  into output data  $c$  of length  $N$  in accordance with a parity matrix  $H$  such that  $H \cdot c = 0$ , comprising:

input means for inputting the user data of block length  $N_u$ ;

$H$   $c$  decomposer means for decomposing  $H \cdot c$  into a first component  $H_u \cdot u$  corresponding to the user data and a second component  $H_p \cdot p$  corresponding to the parity data such that  $H_u \cdot u + H_p \cdot p = 0$ ;

$\underline{u}$  calculating means for calculating a vector  $\underline{u} = H_u \cdot u$ ; and

$p = P \underline{u}$  calculating means for calculating  $p = H_u^{-1} \cdot \underline{u}$ ;

transmitting means for transmitting an output of said low-density parity-check code encoding means to the communication channel;

soft channel decoding means for decoding data from the communication channel; and

soft low-density parity-check code decoding means for decoding data decoded by said soft channel decoding means.

37. (Currently Amended) The system of Claim 36[[,]], wherein  $H_u$  comprises a  $N_p \times N_u$  matrix and  $H_p$  comprises a  $N_p \times N_p$  matrix.

38. (Currently Amended) The system of Claim 36[[,]], further comprising:

address generator means for generating address information in accordance with the user data;

second input means for inputting the address information,

wherein said  $\underline{u}$  calculating means calculates the vector  $\underline{u} = H_u \cdot u$  in accordance with said second input means.

39. (Currently Amended) The system of Claim 36[[,]], wherein said  $\underline{u}$  calculating means updates elements of  $\underline{u}$  as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

40. (Currently Amended) The system of Claim 36[[,]], wherein said  $p = \underline{P} \underline{u}$  calculating means reduces a row weight of  $\mathbf{H}_u^{-1}$  by representing  $\mathbf{H}_u^{-1}$  as  $M1 * M2$ .

41. (Currently Amended) The system of Claim 36[[,]], wherein said  $p = \underline{P} \underline{u}$  calculating means reduces a row weight of  $\mathbf{H}_u^{-1}$  representing  $\mathbf{H}_u^{-1}$  as  $\prod_{i=1}^s M_i$ .

42. (Currently Amended) The system of Claim 36[[,]], wherein said  $\underline{u}$  calculating means calculates the vector  $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$  prior to said  $p = \underline{P} \underline{u}$  calculating means calculating  $p = \mathbf{H}_u^{-1} \cdot \underline{u}$ .